CAMBRIDGE
OCR

Level 3 Alternative Academic Qualification Cambridge Advanced National in Cyber Security and Networks

H137 Unit F194**:** Fundamentals of networks

Sample Assessment Material (SAM)

Time allowed: 1 hour 15 minutes

You can use:

- A calculator

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

Date of birth | D | D | M | M | Y | Y | Y | Y |

INSTRUCTIONS

- Use black ink.
- Write your answer to each question in the space provided. You can use extra paper if you need to, but you must clearly show your candidate number, the centre number and the question numbers.
- In the live exam there might be lined pages at the end of the question paper for you to use if you need extra space. Remember, you must clearly show the question numbers.
- Answer **all** the questions.

INFORMATION

- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- This document consists of **16** pages.

ADVICE

- Read each question carefully before you start your answer.

SAMPLE

© Cambridge OCR 2025 Cambridge OCR is an exempt Charity

1 City Tours produce interactive walking tours of cities.
They have recently moved to a new office and need to set up the network infrastructure.

Some employees work in the office and others are visiting cities taking photos and videos for new tours.

The photos and videos are used to create the interactive walking tours which are available in a variety of app stores.

The office is also used for a range of other tasks including:

- app development
- marketing
- storing customer details
- storing employee details.

(a)

(i) What is the **most** appropriate type of network model for City Tours to use?

.....**[1]**

(ii) State **two** characteristics of this network model.

1.....

.....

2.....

.....

[2]

SAMPLE

© Cambridge OCR 2025

(b) City Tours has decided to use a star topology.

Explain **two** advantages for a business of using a star topology.

1.....

.....

.....

.....

2.....

.....

.....

.....

[4]

SAMPLE

© Cambridge OCR 2025

(c) City Tours need the network to provide a range of services. These services include:

- domain controller
- voice
- email
- firewall.

(i) Which **two** are roles of the domain controller?

Tick (✓) **two** boxes.

Enforces security policies ☐

Routes traffic based on its IP address ☐

Turns domain names into IP addresses ☐

Validates the user ☐

[2]

(ii) State **one** role of a firewall.

.....

..... **[1]**

SAMPLE

© Cambridge OCR 2025

(d) City Tours could use User Datagram Protocol (UDP) or Transport Control Protocol (TCP) in the network.

(i) Compare the characteristics of **UDP** and **TCP** in a network.

.....

.....

.....

.....

.....

..... **[3]**

(ii) State **one other** protocol that could be used in a network.

..... **[1]**

SAMPLE

© Cambridge OCR 2025

2 City Tours has expanded and created the following departments:

- Application Development
- Finance
- Human Resources
- Marketing.

The expansion of City Tours has increased the number of employees. This has led to additional devices on the network and a higher volume of network traffic.

City Tours has decided to create a subnet for their Class C network.

(a)

(i) Explain **one** advantage of creating a subnet for a network.

.....

.....

.....

..... **[2]**

(ii) What would the **default** subnet mask be for a **Class C** network?

..... **[1]**

(iii) How many **hosts** would the subnet mask for a **Class C** network allow?

..... **[1]**

(b) City Tours has established that the maximum number of hosts they need is 62.

Calculate the subnet mask that would be required.

Subnet mask required.....

[3]

© Cambridge OCR 2025

SAMPLE

(c) With additional employees and devices, City Tours needs to increase the number of access points to the network. City Tours has decided that the access points will be hard wired. The office consists of a number of small areas each separated by stone walls.
The new cabling must run their current services and any additional ones they may need in the future. There is no requirement to add additional power sockets. The power and data cables are separate.

Explain **two** reasons why City Tours should use Unshielded Twisted Pair (UTP) cable.

1.....

.....

.....

.....

2.....

.....

.....

.....

[4]

SAMPLE

© Cambridge OCR 2025

3 City Tours wants to introduce wireless networks into the office.

(a) State **one** item of hardware needed for a wireless network.

.....**[1]**

(b) City Tours wants to run both 2.4 Ghz and 5 Ghz wireless networks for both their staff and for visitors.

(i) Identify an appropriate name for the City Tours Service Set Identifier (SSID) for the 5 Ghz visitor network.

.....**[1]**

(ii) State **one** method that could be used to secure a SSID.

.....**[1]**

(iii) Describe **two** reasons why a pre-shared key authentication method (WPA-PSK) is **not** secure.

1.....

.....

2.....

.....
[2]

SAMPLE

© Cambridge OCR 2025

(c)

(i) Explain **two** ways that intervening objects, like stone walls, can affect the performance of wireless networks.

1.....

.....

.....

.....

2.....

.....

.....

.....

[4]

(ii) State **one** way the signal strength of a wireless network can be improved.

.....

.....**[1]**

SAMPLE

© Cambridge OCR 2025

4 When a customer places an order, City Tours store their details on a database server. Data stored on the server includes:

- name
- address
- language spoken
- information about the tour they purchased.

Explain **two** ways that City Tours could use the details stored on the database server.

1.....

.....

.....

2.....

.....

.....

[4]

SAMPLE

© Cambridge OCR 2025

5 City Tours needs to increase the bandwidth on their internet connection.

(a)

(i) What is bandwidth?

.....**[1]**

(ii) City Tours has been offered a connection speed of 64 Mbps.

If a video is 88 MB, how long in **seconds** would it take to upload the video?

Show your working.

Number of seconds: ……

[2]

SAMPLE

© Cambridge OCR 2025

6 When an employee takes a photograph for the tour, the Global Positioning Service (GPS) coordinates of the location are recorded.
City Tours uses the GPS coordinates to plot the location on a map. The location is used to give directions to the customer to find the viewpoint where the photograph was taken.

Each employee is asked to wear a GPS tracker so that City Tours knows their location and where they have been whilst working for them.

(a) Explain how GPS works.

.....

.....

.....

..... **[2]**

(b) Identify **one other** use of GPS for City Tours.

.....

..... **[1]**

SAMPLE

© Cambridge OCR 2025

7 City Tours has expanded and now has employees creating tours for cities in other countries.

An employee in another country will take photographs and videos of tours of different cities. The files sizes are large with photographs commonly over 10 MB and videos over 100 MB.

Employees log on and upload the files for each tour to a folder on the extranet.

Once the photographs and videos have been examined, they are either approved, or a request for additional or replacement files is made.

Analyse how beneficial using an extranet to collect the files for each tour is for City Tours.

[6]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

SAMPLE

© Cambridge OCR 2025

8 Some of the employees who take photographs and videos have expressed an interest in creating tours. This would require them to have access to the same version of the specialist software and training on how to use it. The hardware used by employees varies greatly in terms of platform and performance.

Discuss whether you would recommend that City Tours use application or desktop virtualisation for employees to complete the training and create their own tours.

In your answer you must write about:

- the advantages and disadvantages of using application virtualisation
- the advantages and disadvantages of using desktop virtualisation
- whether you would recommend that City Tours use application or desktop virtualisation **and** your reasons.

[9]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

SAMPLE

© Cambridge OCR 2025

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

END OF QUESTION PAPER

SAMPLE

© Cambridge OCR 2025

SAMPLE

This is sample assessment material for our specification. It is to help show how the live assessment materials will look. During the lifetime of the qualification, you might see small adjustments to the assessment materials. This is part of continuous improvement, designed to help you and your students. We recommend you look at the most recent set of past papers where available

Copyright Information

Cambridge OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. Cambridge OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the Cambridge OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If Cambridge OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material Cambridge OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact the Copyright Team, Cambridge OCR (Oxford, Cambridge and RSA Examinations), The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA.

Cambridge OCR is part of Cambridge University Press & Assessment, which is itself a department of the University of Cambridge.

© Cambridge OCR 2025

Level 3 Alternative Academic Qualification Cambridge Advanced National in Cyber Security and Networks

Unit F194: Fundamentals of networks

Sample Assessment Material (SAM)

Mark scheme

This document has **14** pages.

SAMPLE

 © Cambridge OCR 2025

Marking instructions

Crossed-out answers

If a student has crossed out an answer and written a clear alternative, do **not** mark the crossed-out answer.

If a student has crossed out an answer and **not** written a clear alternative, give the student the benefit of the doubt and mark the crossed-out answer if it's readable.

Multiple choice question answers

When a multiple choice question has only one correct answer and a student has written two or more answers (even if one of these answers is correct), you should **not** award a mark.

When a student writes more than one answer

1. Questions that ask for a set number (including 1) of short answers or points

If a question asks for a set number of short answers or points (e.g. **two** reasons for something), mark only the **first set number** of answers/points.

First mark the answers/points against any printed numbers on the answer lines, marking the **first** answer/point written against each printed number. **Then**, if students have not followed the printed numbers, mark the answers/points from left to right on each line and **then** line by line until the set number of answers/points have been marked. Do **not** mark the remaining answers/points.

2. Questions that ask for a single developed answer

If a student has written two or more answers to a question that only requires a single (developed) answer, and has **not** crossed out unintended answers, mark only the first answer.

3. Contradictory answers in points-based questions

When a student has written contradictory answers, do **not** award any marks, even if one of the answers is correct.

Levels of Response marking

1. To determine the level start at the highest level and work down until you reach the level that best describes the answer

2. To determine the mark within the level, consider the following:

Quality of the answer	**Award mark**
Consistently meets the criteria for this level	At the top of the level (6 and 9 mark questions)
Meets the criteria but with some inconsistency	At the middle of the level (9 mark questions)
On the borderline of this level and the one below	At the bottom of the level (6 and 9 mark questions)

SAMPLE

 © Cambridge OCR 2025

ANNOTATIONS

Annotation	Meaning
	Correct response
	Incorrect response
	Positive
	Negative
	Level 1
	Level 2
	Level 3
	Omission mark
	Benefit of doubt given (this annotation counts as a mark so do not tick as well)
	Contradiction
	Repeat
	Too vague
	Noted but no credit given

SAMPLE

 © Cambridge OCR 2025

1 (a) (i)	
Max mark	1 (PO2)
Answer	Client-server (1)
Guidance	Correct answers only

1 (a) (ii)	
Max mark	2 (PO1)
Answer	Any **two** from: • Distributed computing architecture (1) • Server provides a function/resource (1) • Client is any device which requires an external service (1)
Guidance	1 mark for each correct answer. You should mark this question based on the answer given in **(1ai)**. If the incorrect network model is given in **(1ai)** then allow error carried forward.

1 (b)	
Max mark	4 (PO1)
Answer	Up to **two** marks for each advantage. **One** mark for stating an advantage. **One** mark for explaining the advantage. • Reliability (1) if a single cable fails the network will still function (1) • High performance (1) less data collisions on each cable (1) • Less disruption when adding new devices (1) each cable is separate from the rest of the network (1) • Problem solving is simpler (1) as each node is separate (1) **Credit any other appropriate response.**
Guidance	Up to **two** marks for each advantage. Maximum **two** advantages.

1 (c) (i)	
Max mark	2 (PO1)
Answer	• Enforces security policies (1) • Validates the user (1)
Guidance	1 mark for each correct answer. Correct answers only. If a student ticks **more than two** boxes, award **0 marks** for the whole question.

SAMPLE

 © Cambridge OCR 2025

1 (c) (ii)	
Max mark	1 (PO1)
Answer	• Monitors incoming/outgoing network traffic and permits/blocks traffic based on rules (1) • Analyse traffic and allow through based on whitelist/blacklist (1) **Credit any other appropriate response.**
Guidance	Do **not** accept: • Stops viruses • Blocks users

1 (d) (i)	
Max mark	3 (PO1)
Answer	Any **three** from: • TCP has a slower data transfer rate whereas UDP has a faster data transfer rate (1) • TCP is more reliable and has less errors whereas UDP does not have guaranteed transfers and more errors (1) • Both send packets of data on a network (1) • Both are built on the IP (1) • TCP is connection orientated whereas UDP is connectionless (1) • TCP sends an acknowledgement that all data is delivered whereas UDP sends no acknowledgement (1) **Credit any other appropriate response.**
Guidance	1 mark for each correct answer. Both sides (TCP and UDP) are required to gain the mark. Allow both similarities and differences.

1 (d) (ii)	
Max mark	1 (PO1)
Answer	• HTTP (1) • HTTPS (1) • FTP (1) • IP (1) • DHCP (1) **Credit any other appropriate response.**
Guidance	Do **not** accept: • TCP • UDP

SAMPLE

 © Cambridge OCR 2025

2 (a) (i)	
Max mark	2 (PO1)
Answer	Up to **two** marks for advantage explained. **One** mark for stating the advantage. **One** mark for explaining the advantage. • Reduces data collisions (1) this means that there are less resends of data and network traffic is reduced (1) • Allows network devices to be logically grouped (1) which means that boundaries can be created, and data separated (1) • Allows IP addresses to be reused (1) which means that you will not run out of IP addresses and can add new devices (1) **Credit any other appropriate response.**
Guidance	Up to **two** marks for the advantage explained. Maximum **one** advantage.

2 (a) (ii)	
Max mark	1 (PO1)
Answer	255.255.255.0 (1)
Guidance	Correct answer only.

2 (a) (iii)	
Max mark	1 (PO1)
Answer	254 (1)
Guidance	Correct answer only.

2 (b)	
Max mark	3 (PO2)
Answer	• 62 in binary is 111110(1)/requires 6 bits (1) • Mask for 6 bits is 11000000 which is 192 in decimal (1) • 255.255.255.192 (1)
Guidance	Look for the correct answer **first**. If the correct answer is present, award full marks and **ignore** anything else that is written in the answer space. Otherwise: • 1 mark for converting 62 into binary/recognising 62 requires 6 bits • 1 mark for applying the 6 bit mask to an 8 bit binary number

SAMPLE

 © Cambridge OCR 2025

2 (c)	
Max mark	4 (PO2)
Answer	Up to **two** marks for each reason: **One** mark for identifying the reason. **One** mark for explaining the reason. • Suitable for short distance networks (1) which suits the small areas in the building infrastructure that City Tours has without needing fibre (1) • The capacity of UTP is up to 10GB (1) this means that City Tours can increase the number of devices as well as the volume of data without a noticeable drop in performance (1) • Can transmit both voice and data (1) so City Tours can use VOIP without installing a second cable and so make use of additional services (1) • The power and data signals will not interfere with each other (1) so City Tours does not need a shielded cable type (1) **Credit any other appropriate response.**
Guidance	Up to **two** marks for each valid reason. Maximum **two** factors. Must be linked into use of network by City Tours, can be linked to disadvantages of STP/fibre

3 (a)	
Max mark	1 (PO1)
Answer	• WAP (1) • WNIC (1)
Guidance	

3 (b) (i)	
Max mark	1 (PO2)
Answer	• CityTours5GhzVisitor (1) • CityTours5GhzGuest (1) **Credit any other appropriate response.**
Guidance	Must be identifiable as City Tours Network. Must contain reference to 5 Ghz. Must contain reference to Guest/Visitor.

3 (b) (ii)	
Max mark	1 (PO1)
Answer	• Set up a hidden SSID (1) • Create a password for the SSID (1)
Guidance	

SAMPLE

3 (b) (iii)	
Max mark	2 (PO1)
Answer	Any **two** from: • Once the password has been given out, anyone with it can access the network (1) • The network does not require a valid user on the system to allow WiFi access (1) • When anyone leaves the company, the password should be changed and if it isn't they will still have access (1) **Credit any other appropriate response.**
Guidance	1 mark for each correct answer.

3 (c) (i)	
Max mark	4 (PO1)
Answer	Up to **two** marks for each way the performance may be affected: **One** mark for stating the way the performance may be affected. **One** mark for explaining the way • The signal will need to travel further which will take longer (1) as it may not be able to go in a straight line through the wall/it may be diverted by material in the wall (1) • The signal will hit objects in the wall which will corrupt the signal (1) which means that resends will be needed which take longer and increase network traffic (1) • The signal may not get through or be too degraded to be of any use (1) which means that there are dead spots where no signal can be picked up (1) **Credit any other appropriate response.**
Guidance	Up to **two** marks for each valid way. Maximum **two** ways.

3 (c) (ii)	
Max mark	1 (PO1)
Answer	• Reduce distance from WNIC to WAP (1) • Increase power output from WAP (1) • Add a signal amplifier/repeater/extender (1) • Change position of WAP (1) **Credit any other appropriate response.**
Guidance	

SAMPLE

4	
Max mark	4 (PO2)
Answer	Up to **two** marks for each use identified: **One** mark for identifying the way to use the details. **One** mark for explaining the use • Produce reports on the most popular tour (1) so City Tours can raise prices of them to make more profit (1) • Target customers (1) so they can be given discounts on tours that are close to where they live (1) • Identify tours that are not selling (1) so that they can be discounted to try and attract more customers (1) • Group those who speak a particular language together (1) so that a tour guide who speaks that language can run that tour (1) **Credit any other appropriate response.**
Guidance	Up to **two** marks for each use. Maximum **two** uses. Must be linked into use of database server by City Tours for storing customer details.

5 (a) (i)	
Max mark	1 (PO1)
Answer	• Volume of data over time (1) • Capacity of a communications channel (1)
Guidance	Do **not** accept: • Speed of the network

5 (a) (ii)	
Max mark	2 (PO2)
Answer	• 64 Mbps / 8 = 8 MBps AND 88 / 8 (1) • 11 (1)
Guidance	Look for the correct answer **first**. If the correct answer is present, award full marks and **ignore** anything else that is written in the answer space. Otherwise: • 1 mark for bringing the connection speed and file size to comparative values AND dividing file size by base value

SAMPLE

 © Cambridge OCR 2025

6 (a)	
Max mark	2 (PO1)
Answer	Any **two** from: • Line of sight to four satellite (1) • Satellite sends location and time (1) • Uses trilateration to determine location (1)
Guidance	Accept a value more than four, but **not** less Do not accept: • Triangulation

6 (b)	
Max mark	1 (PO2)
Answer	• Can use the route taken by the employee to plot a map for a customer (1) • Will know the location if an employee is injured on route (1) **Credit any other appropriate response.**
Guidance	Must be a use for City Tours

SAMPLE

 © Cambridge OCR 2025

7	
Max mark	6 (PO3)
Levels of Response	**Level 3 (high) 5-6 marks** A **thorough** analysis, which includes: • identification of a **range** of characteristics or elements • **detailed** knowledge and understanding in the context of the question • **clear** explanation • **consistent** use of appropriate subject terminology. **Level 2 (mid) 3-4 marks** An **adequate** analysis, which includes: • identification of **some** characteristics or elements • **sound** knowledge and understanding in the context of the question • **adequate** explanation • **some** use of appropriate subject terminology. **Level 1 (low) 1-2 marks** A **basic** analysis, which includes: • identification of **at least one** characteristic or element • **limited** knowledge and understanding in the context of the question • **basic** explanation • use of appropriate subject terminology is **limited**. **0 marks** Answer is **not** worthy of credit.
Indicative Content	Answers can include some of the following: • Employees can upload the videos, which will have a very large file size, to the extranet in one go, otherwise they would have to email them separately by making very short videos or cutting them into small file sizes. • City Tours can use file structures such as folders to organise content if an employee does different tours – all the files for each tour can be stored in one folder and videos for each tour will not get mixed up. • Videos and photos can be overwritten and the replacement files can be kept in the same folder, allowing all parties to work on the same version – if a request for an additional photo is made by City Tours, overwriting will make sure the old version is not used. • As employees all store their files in one location, City Tours do not need to back up multiple locations, making it less likely to miss a file and easier to restore if required. • As employees taking video and photos for the tours are all over the world, they will have different access to the internet. An extranet is accessible with any speed internet connection and City Tours does not have to wait for employees to return to the office to get the files. • Logs of user access are kept by City Tours so they know if an employee has uploaded the files in case of a dispute.

SAMPLE

	• Will improve security as only employees of City Tours with the correct access levels on the system can access the extranet. • It can be confusing for employees if sending multiple emails to keep track of what files have been sent. By using an extranet City Tours and employees can see exactly what has been uploaded and what other files are required to make the tour. **Credit other relevant analysis, points and examples**

SAMPLE

8	
Max mark	9 (PO3)
Levels of Response	**Level 3 (high) 7-9 marks** A **thorough** discussion which shows **detailed** evaluation, which includes: • a **range** of points from **both** sides of the argument • a **detailed** analysis in the context of the question • a **clear** conclusion(s) with **detailed** reasons/justifications • **consistent** use of appropriate subject terminology. **Level 2 (mid) 4-6 marks** An **adequate** discussion which shows **sound** evaluation, which includes: • **some** points from **both** sides of the argument • **some** analysis in the context of the question • an **adequate** conclusion(s) with **relevant** reasons/justifications • **some** use of appropriate subject terminology. **Level 1 (low) 1-3 marks** A **basic** discussion which shows **limited** evaluation, which includes: • a **few** points from the argument • a **limited** analysis in the context of the question • a **brief** conclusion(s) with **limited** reasons/justifications • use of appropriate subject terminology is **limited**. **0 marks** Answer is **not** worthy of credit.
Indicative Content	Answers can include some of the following: Advantages of application virtualisation include: • If an employee has a low performance device, they will be able to use the specialist software through the virtualised environment, which would not run natively on their machine. • The individual hardware used by employees does not matter – whether it is Apple or PC or Linux the virtualised application will be uniform and City Tours only need to support and train on one virtualised application. • Any updates to the application will be done centrally meaning all employees will be on the same version. Disadvantages of application virtualisation include: • Not every application can be virtualised and work flawlessly on every platform. • The software is specialised and unlikely to be in general use, so technical support on how to virtualise it will be limited for City Tours to access.

SAMPLE

	• It can be difficult to troubleshoot if there are problems with application virtualisation, as the problem could be on the City Tours server or the employees' devices and connection. • Application virtualisation can require device drivers that are specific to the hardware that the employee is using to work correctly and may not be available for all platforms. Advantages of desktop virtualisation include: • Once virtualised City Tours can use the desktop for more than just delivering the application – editing video or photographs for example can be done from the virtualised desktop. • City tours will be able to directly interact with the employees when they are online and assist them, even accessing their virtualised desktop remotely. • The individual hardware used by employees does not matter – whether it is Apple or PC or Linux the virtualised desktop will be uniform and City Tours only need to support and train on one virtualised environment on one platform. • Any updates to the virtualised environment will be done centrally meaning all employees will be on the same version and only one version of training materials needs to be provided by City Tours. Disadvantages of desktop virtualisation include: • If an employee does not know how to use a particular platform, they will have more usability issues and may not be able to complete the training. • City Tours will need to license the desktop environment as well as the application, which will increase costs. • There is additional bandwidth required for the entire desktop environment instead of just the application. • The server infrastructure required by City Tours needs to be high performance, which will be expensive. • The server infrastructure required by City Tours needs to have experienced technical support to install, maintain and support it. **Credit other relevant conclusions, points and examples.**

SAMPLE